ENGINEERING CHANGE PROPOSAL
(SHORT FORM)

(See MIL-STD-481 for instructions)

DATE *(YYYYMMDD)* 20040831 | *Form Approved OMB No. 0704-0188*

PROCURING ACTIVITY NUMBER **N/A**

1. ORIGINATOR NAME AND ADDRESS
Kase J. Saylor
Southwest Research Institute
6220 Culebra Rd. Bldg. 189
San Antonio, TX 78238

2. CONTRACT NUMBER AND LINE ITEM

3. PROCURING CONTRACTING OFFICER
CODE | TEL

4. TITLE OF CHANGE
Clean up Attachment 1 for readability

5. ECP NUMBER	REV	AMEND	6. CAGE CODE	7. CLASS OF ECP	8. JUST.CODE	9.PRIORITY
MCC 2004015						

10. SPECIFICATIONS AFFECTED

CAGE CODE	SPECIFICATION / DOCUMENT NO.	REV
	PMT 90-S002	I

11. DRAWINGS AFFECTED

CAGE CODE	NUMBER	REV

12. CONFIGURATION ITEM NOMENCLATURE / TYPE DESIGNATION / WEAPON SYSTEM CODE
N/A

13. IN PRODUCTION
☐ **YES** ☐ **NO**

14. LOWEST ASSEMBLY AFFECTED

NOMENCLATURE	PART NO.	NSN
N/A		

15. DESCRIPTION OF CHANGE (Attach a document showing [a] existing document paragraph, figure, or table and [b] modified document paragraph, figure, or table with the change incorporated).
Clean up Attachment 1 for readability.

16. NEED FOR CHANGE
Clarification

17. EFFECT ON ASSOCIATED EQUIPMENT

18. PRODUCTION EFFECTIVITY BY SERIAL NUMBER

19. EFFECT ON PRODUCTION DELIVERY SCHEDULE

20.RECOMMENDED RETROFIT EFFECTIVITY

21. ESTIMATED KIT DELIVERY SCHEDULE

22. ESTIMATED COST/SAVINGS

23. SUBMITTING ACTIVITY AUTHORIZING SIGNATURE
Kase Saylor Signed 11/8/2004

23.a. TITLE
Engineer SWRI

24. APPROVAL/DISAPPROVAL a. RECOMMENDED [X] APPROVAL [ ] DISAPPROVAL

b. APPROVAL	c. GOVERNMENT ACTIVITY	SIGNATURE	DATE *(YYYYMMDD)*
[X] APPROVED [ ] DISAPPROVED	PEOSTRI 12350 Research Parkway Orlando, FL 32826-3276	Perry R. Smith, LTC AD PMLTS	*20041108*
d. APPROVAL	e. GOVERNMENT ACTIVITY	SIGNATURE	DATE *(YYYYMMDD)*
[ ] APPROVED [ ] DISAPPROVED			

DD FORM 1693, AUG 96 (EG) PREVIOUS EDITION MAY BE USED. Designed using Microsoft Word, Dec 99

15a. Existing document paragraph, figure, or table.

Note 1: Rapid Fire Weapon, Direct Fire Routine (DFR), Encoding Adaptation.
Rapid-fire weapons, such as 50 Cal Machine Gun, fired in the burst mode using blank fire ammunition require an encoding adaptation. This configures the DFR for the specific rapid-fire weapon to adequately simulate its enhanced lethality over single shot lethality expectations. In the adaptation, the encoder will suppress the Near Miss Message portion of the DFR as follows:
1. A special blank round detonation sensor system detects the firing of a blank round by sensing its detonation to generate a detonation event signal. This signal informs the encoder of the detonation event.
2. The first round detonation event signal, in a rapid fire burst, initiates the appropriate DFR sequence for the blank ammunition fired.
3. The second and subsequent detonation event signals, in a given rapid fire burst, each initiates the suppression of the encoding of the Near Miss Message portion of the previous fired round's DFR by truncating it. If a second or subsequent detonation signal occurs before the previous DFR Near Miss Message enters encoding sequence, all of it is suppressed. If the signal occurs during the Near Miss Message encoding sequence, the sequence is truncated from that time on.
4. The second or subsequent detonation event signal instantly initiates the next fired round's DFR. The process repeats until the fire burst is completed with the last round resulting in the encoding of the complete DFR appropriate for the given rapid fire weapon.

Note 2: Direct Fire Weapon Lethality Effects Assessment Routine:
When a MILES Decoder successfully decodes two (2) Hit Words within an eight (8) Hit Word transmission time interval, it initiates a Lethality Effects Assessment Routine (LEAR) to assess the lethality effects status of the host target based on the decode incident.
There is a range dependency inherent in this implementation. At close ranges, the Decoder can, with high probability of success, decode four (4) pairs of Hit Words out of a received eight (8) Hit Word sequence. The Decoder will initiate the LEAR four times in this case. At long range, due to the lower probability of a successful reception of the transmitted Hit Word signal by the MILES Target System, the Decoder may successfully decoded fewer than four (4) pairs of Hit Words. It probably will initiate the LEAR less than four times.
Since the LEAR is entered more than once, and with high probability, four (4) times at close range, the actual probability for each execution of the LEAR must be set less than the desired single weapon ammunition engagement close range lethality effect status Kill Probability. (One Kill lethality effect status assessment outcome from the multiple LEAR executions is sufficient to kill the target.) The equation relating the two probabilities is:
$Pk = 1-(1 - PW)D$
Where Pk = Kill Probability given all Hit Words were received and successfully decoded (close range condition).
PW = Kill Probability given a single pair of Hit Words were received and successfully decoded.
D = Number of executions of the LEAR given perfect reception and decode.
The decoder will initiate the LEAR when any one of the following events occurs:
1. Two (2) identical MILES codes with an identical PID's are detected within the appropriate time window.
2. Two (2) identical MILES codes with 1 valid PID is detected (one code contains a PID that contains an error, not PID 0000) within the appropriate time window. The valid PID is used for the LEAR and display.
3. Two (2) identical MILES codes with no valid PID's detected (both PID's contain errors, not PID 0000) within the appropriate time window. PID 0000 is used for the LEAR. PID FFFF is displayed.

Pk for various weapon's lethality status assessment evaluations are listed in the Pk Tables attached. [The exception is for some Manworn and crew served systems only one word is needed.]

Note 3: Lethality Effects Assessment Routine for Missile Weapons:
For Missile Weapons, LEAR is entered using the Pk value corresponding to the Missile Weapon Code in the Pk Table when a Hit is decoded to determine whether the hit caused a kill. The Hit/Kill decision statistics for the Missile Weapons are based upon the weapon and target type involved.

Note 4: Multi-Level Lethality Effects Status For Heavy Weapon Hit.
The multi-level lethality effects assessment for will be one of the following categories:
Catastrophic Kill (Catk).
Firepower Kill (Fk).
Mobility Kill (Mk).
Commo Kill (Ck).
Hit.
LEAR will assess the category for a hit based on the following formula:
Catk = Pk x Ammo Factor x Aspect Angle Modifier.
If a Catastrophic Kill is not assessed, then a Firepower Kill assessment is made where Fk = Catk x Fpk Factor.
If a Firepower Kill is not assessed, then a Mobility Kill is assessed where Mk = Catk x Mobk Factor.

If a Mobility kill is not assessed, then a Commo kill shall be assessed as Ck = Catk x Comk Factor.
If a Commo kill is not assessed, then a Hit is assessed.
The value of Ammo Factor is based on the lethality of the particular ammunition. The MCC will allow a total of eight (8) Ammo Factors. The exact values for the additional four Ammo factors (#5, #6, #7 & #8) will be specified as additional ammunition are included

15b. Modified document paragraph, figure, or table with the change incorporated.

NOTE 1: Rapid Fire Weapon, Direct Fire Routine (DFR), Encoding Adaptation.
Rapid-fire weapons, such as 50 Cal Machine Gun, fired in the burst mode using blank fire ammunition require an encoding adaptation. This configures the DFR for the specific rapid-fire weapon to adequately simulate its enhanced lethality over single shot lethality expectations. In the adaptation, the encoder will suppress the Near Miss Message portion of the DFR as follows:

1. A special blank round detonation sensor system detects the firing of a blank round by sensing its detonation to generate a detonation event signal. This signal informs the encoder of the detonation event.
2. The first round detonation event signal, in a rapid fire burst, initiates the appropriate DFR sequence for the blank ammunition fired.
3. The second and subsequent detonation event signals, in a given rapid fire burst, each initiates the suppression of the encoding of the Near Miss Message portion of the previous fired round's DFR by truncating it. If a second or subsequent detonation signal occurs before the previous DFR Near Miss Message enters encoding sequence, all of it is suppressed. If the signal occurs during the Near Miss Message encoding sequence, the sequence is truncated from that time on.
4. The second or subsequent detonation event signal instantly initiates the next fired round's DFR. The process repeats until the fire burst is completed with the last round resulting in the encoding of the complete DFR appropriate for the given rapid fire weapon.

NOTE 2: Direct Fire Weapon Lethality Effects Assessment Routine:

When a MILES Decoder successfully decodes two (2) Hit Words within an eight (8) Hit Word transmission time interval, it initiates a Lethality Effects Assessment Routine (LEAR) to assess the lethality effects status of the host target based on the decode incident.

There is a range dependency inherent in this implementation. At close ranges, the Decoder can, with high probability of success, decode four (4) pairs of Hit Words out of a received eight (8) Hit Word sequence. The Decoder will initiate the LEAR four times in this case. At long range, due to the lower probability of a successful reception of the transmitted Hit Word signal by the MILES Target System, the Decoder may successfully decode fewer than four (4) pairs of Hit Words. As a result, the LEAR would likely be initiated less than four times.

Since the LEAR is entered more than once, and with high probability, four (4) times at close range, the actual probability for each execution of the LEAR must be set less than the desired single weapon ammunition engagement close range lethality effect status Kill Probability. (One Kill lethality effect status assessment outcome from the multiple LEAR executions is sufficient to kill the target.) The equation relating the two probabilities is:

$P_k = 1-(1 - P_W)^D$
$P_W=1-(1-P_K)^{1/D}$

Where P_k = Kill Probability given all Hit Words were received and successfully decoded (close range condition).
P_W = Kill Probability given a single pair of Hit Words were received and successfully decoded.
D = Number of executions of the LEAR given perfect reception and decode.

The decoder will initiate the LEAR when any one of the following events occurs:

1. Two (2) identical MILES codes with identical PIDs are detected within the appropriate time window.
2. Two (2) identical MILES codes with one valid PID is detected (one code contains a PID that contains an error, not PID 0000) within the appropriate time window. The valid PID is used for the LEAR and display.
3. Two (2) identical MILES codes with no valid PIDs detected (both PIDs contain errors, not PID 0000) within the appropriate time window. PID 0000 is used for the LEAR. PID FFFF is displayed.

P_k for various weapon's lethality status assessment evaluations are listed in the P_k Tables attached. [The exception is for some Manworn and standalone TOW Systems only one word is needed.]

NOTE 3: Lethality Effects Assessment Routine for Missile Weapons:

For Missile Weapons, LEAR is entered using the P_k value corresponding to the Missile Weapon Code in the P_k Table when a Hit is decoded to determine whether the hit caused a kill. The Hit/Kill decision statistics for the Missile Weapons are based upon the weapon and target type involved.

NOTE 4: Multi-Level Lethality Effects Status For Heavy Weapon Hit.

The multi-level lethality effects assessment for will be one of the following categories:

- Catastrophic Kill (Cat_k).
- Firepower Kill (F_k).
- Mobility Kill (M_k).
- Commo Kill (C_k).
- Hit.

LEAR will assess the category for a hit based on the following formula:

$Cat_k = P_k$ x Ammo Factor x Aspect Angle Modifier.
If a Catastrophic Kill is not assessed, then a Firepower Kill assessment is made where $F_k = Cat_k$ x Fp_k Factor.
If a Firepower Kill is not assessed, then a Mobility Kill is assessed where $Mk = Cat_k$ x Mob_k Factor.
If a Mobility kill is not assessed, then a Commo kill shall be assessed as $Ck = Cat_k$ x Com_k Factor.
If a Commo kill is not assessed, then a Hit is assessed.

The value of Ammo Factor is based on the lethality of the particular ammunition. The MCC will allow a total of eight (8) Ammo Factors. The exact values for the additional four Ammo factors (#5, #6, #7 & #8) will be specified as additional ammunition are included